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Smart Power Monitoring System on Solar

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Abstract: The design and development of a Smart Power monitoring device has reported in this paper. System has been designed that can be used to monitor electrical appliances such as voltage, current and power of solar panel. The system consists of a smart sensing unit that detects and controls the energy deliver and it used for daily activities by following different tariff rates. A developed prototype has been extensively tested and experimental results have compared with conventional measuring devices. This work has been designed to implement smart power monitoring and control system through IOT using cloud data storage.In this system we are collecting the energy data from the solar panel and pass it to the microcontroller device. The device will pass this collected data via RS232 to the GSM sender.Here two GSM devices are used, that is sender and receiver.The PHP will perform some operation on the received data and stored it in database.

Keywords: *IOT, Energy Monitoring, Power.*

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1. Introduction

Electricity is the most basic need of everyone in this world. Energy consumption graph is increasing dailywhereas the resources of energy are diminishing parallel.Usage of power is continuously growing drastically paving the way for energy efficient technologies and digging for renewable energy sources.Since prevention is better than cure awareness of energy consumption shouldbrought into every place before resources get extinguished.Industrial users consume about 38 percent of the total energy, personal and commercial transportation consumes 21 percent whereas residential appliances consume 11 percent, and commercial uses amount to 5 percent of the total energy and remaining 27 percent of the world's energy is lost in energy transmission and generation.The designed system will help in reducing the energy wastage by continuously monitoring and controlling the electrical appliances.Electric energy is the main source for the development in this technological world. The technology develops the power requirement and daily power demand is increasing. These power demands occur in domestic and industrial sectors. According to recent Annual Energy report it is observed that residential electricity demands are forecasted to increase by 25% within the following several decades, while the global electricity consumption trend is also reported to be increasing continuously. Electric Energy demand is increasing and the fossil fuels are diminishing due to rising consumption of energy.As we have seen that more and more home appliances and consumer electronics are installed, residential energy consumption tends to grow very rapidly.

2. System Architecture

2.1 Components Required

2.1.1Hardware Components

The hardware of the system includes microcontroller, temperature sensor, power supply, Battery, PV sensing, RS232 IC, RS232 Connector, RS232 Cable, GSM module.

2.1.1.1 Microcontroller

The microcontroller is chosen for this application since it provides peripheral support for collecting the data from the system peripherals which helps in implementing IOT part of the system. Which helps to monitor the values of sensors through Internet. It consumes low power, it is also of low cost and it can operate up to 100MHz.

2.1.1.2 Temperature Sensor

Contact sensor include thermocouples and thermistors that touch the object they are to measure, and noncontact sensors measure the thermal radiation a heat source

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releases to determine its temperature. The latter group measures temperature from a distance and often are used in hazardous environments.

2.1.1.3 Power Supply

The power supply is used to provide the power to microcontroller device.

2.1.1.4 Battery

Battery is the secondary power supply provided to the microcontroller. In order to the condition when the power gets off, then to keep device in start condition, the battery will provide the power supply to the microcontroller device.

2.1.1.5 PV Sensing

PV sensing is the unit by which the all sensors data will be collected and provide it to the microcontroller device.

2.1.1.6 RS232 IC, RS232 Connector, RS232 Cable

RS232 IC is used to make the serial transmission between the microcontroller and GSM device. RS232 connector used to make connection with the RS232 IC and RS232 cable.

2.1.1.7 GSM Module

GSM module is used for the transmission of the data. There are two GSM modules are used in this project. The GSM1 is used for sending the data and GSM2 is used to receiving the data.

2.1.2 Software

2.1.2.1 Visual Studio

Visual studio Software Development Kit (SDK) is used to design the Front end application of the project. It provides VB for the development.

2.1.2.2 Xampp

Xampp server application is used to develop database for the project no localhost.

2.2 Design Diagram

The proposed system is for scenario in which there are one room. In whicha microcontroller and sensor units are designed. Both the controllers are connected to the GSM module using RS232 communication device.

3. Implementation

3.1 Model Architecture

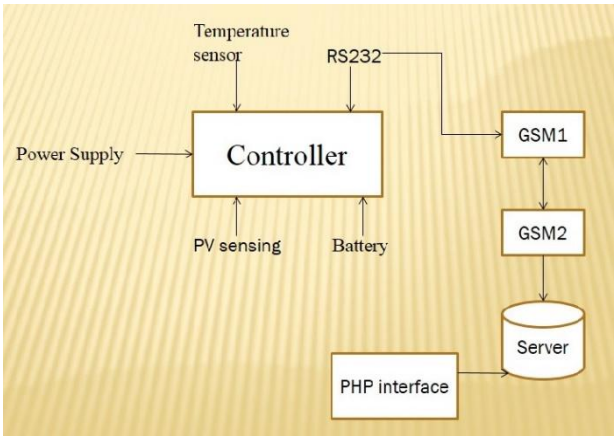

Figure 1: Model Architecture

In this model architecture there is one microcontroller device as “Controller”. All the peripherals are connected to the main device. The microcontroller will collect all the data from its peripherals and transfer it to the GSM device via RS232 communication port. The Temperature sensor can provide the information about the temperature to the microcontroller. Power supply is provided to the microcontroller device to perform its operations. The PV sensing unit will collect all the sensors data and provide it to the microcontroller. There is the secondary power supply is provided to main device i.e. Battery. The RS232 is used to make the serial transmission of the data between microcontroller and GSM sender device. There are two GSM devices are used to make transmission of the data. It is easy to send the small single message by using the GSM device. There one GSM1 device is used to send the message and the GSM2 device is used to receive the message.

The user application will take the message from the GSM device and stored it into the database. The database is located at the server side. The user application that is front end application is developed by using the Visual Basic language. It is very easy to develop the user end application by using VB. The server side application is developed by using the PHP programming language with My SQL. The XAMPP server application is used to make the local host server.

4. Results

4.1 Experimental Setup

The entire system is set up as shown in the Figure 1. The system consists of Microcontroller device and the User application Program. The hardware system can operated based on the relay.

4.2 Monitoring the current values

The measured data from the sensors can be stored in Microcontroller first. For each sensor it is to be measured.

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Feed id and API key are provided to system and then code is executed in order to update the values.

4.3 Client-Server Communication

The client-server communication will be done by using Remote Procedure Calls (RPC). HTTP is the communication protocol used for established the communication. The commands and arguments are passed in between client and server applications.

5. Conclusion

We have conclude that the average energy consumption of the appliances will reduced since they are turned off when unused. By employing the proposed automation system, the total energy consumption will reduced. On a whole in a year up to 15 percent of energy can be saved in residential building by implementing Smart Power monitoring and control System through IOT.

6. Images

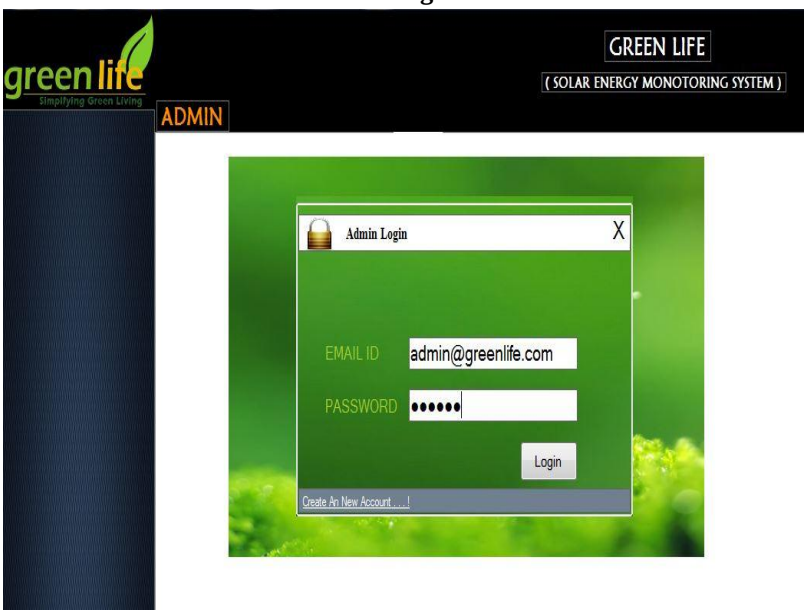

Figure 2: Login Page

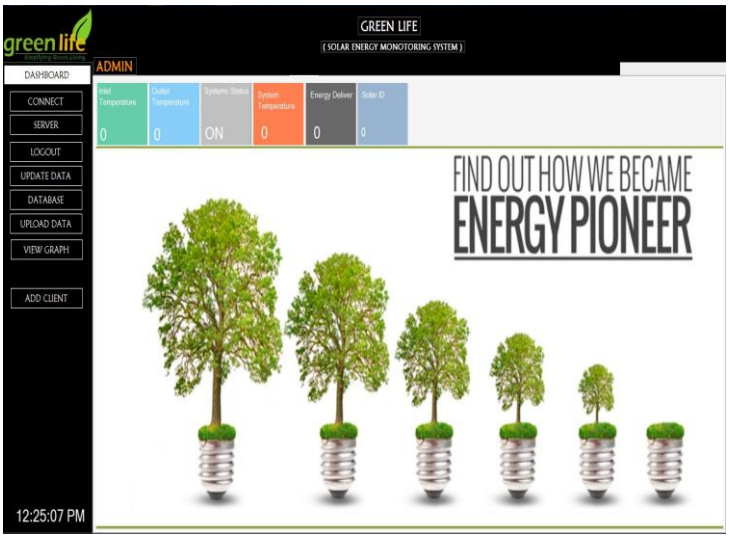

Figure 3: Dashboard

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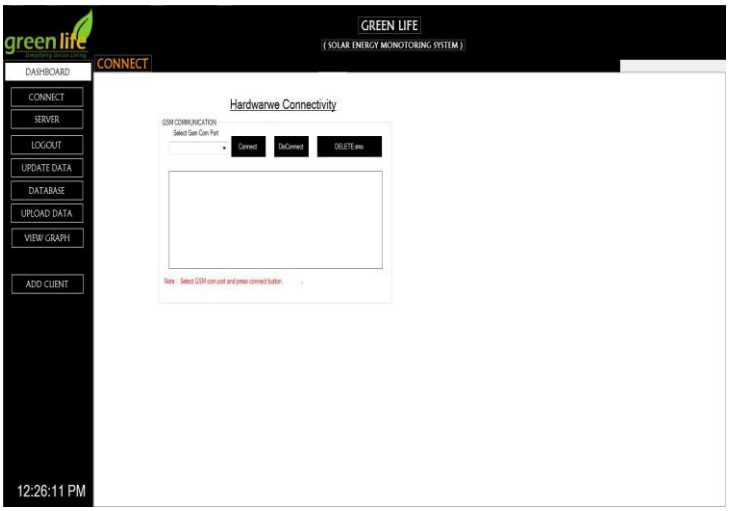

Figure 4: Hardware Connectivity

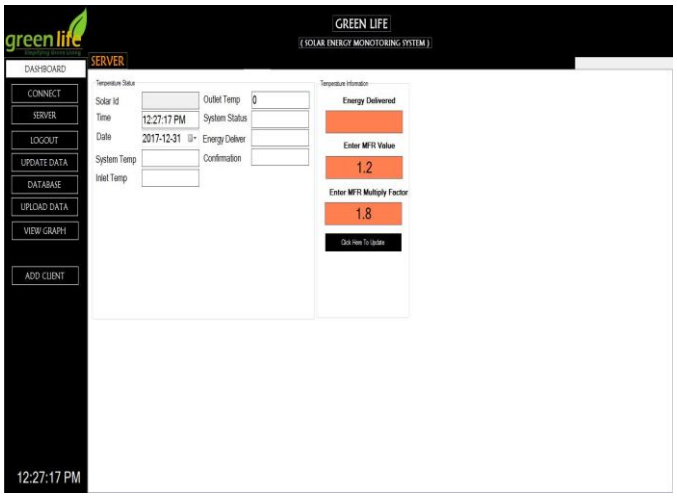

Figure 5: Server Data

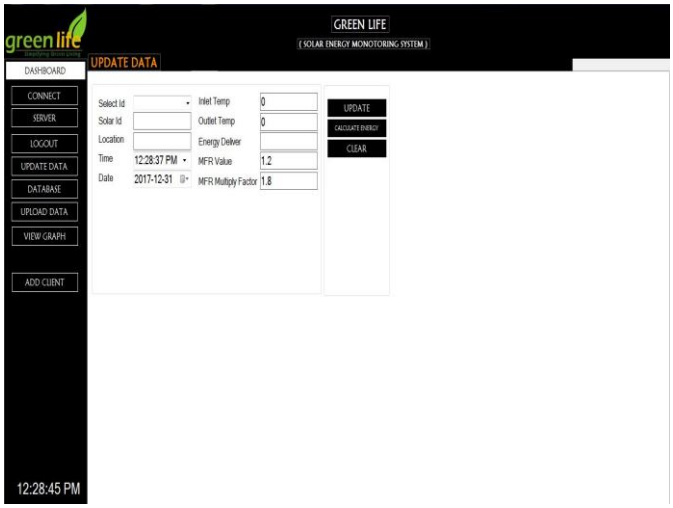

Figure 6: Update data

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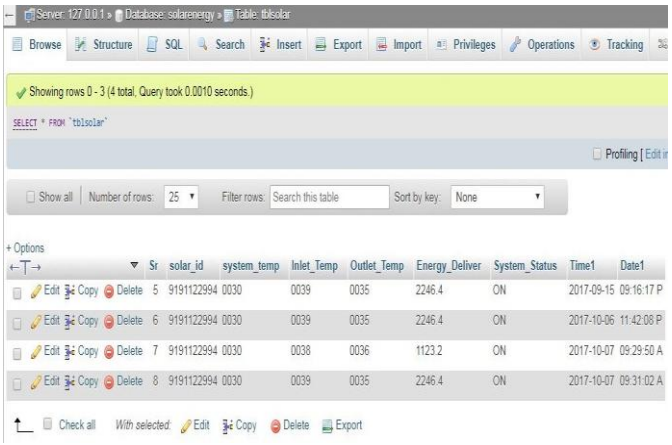

Figure 7: Database table

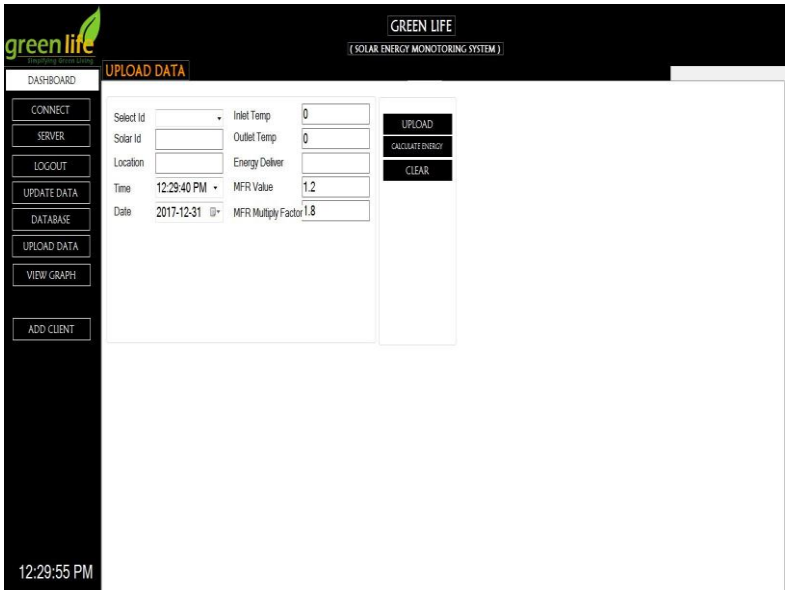

Figure 8: Upload data

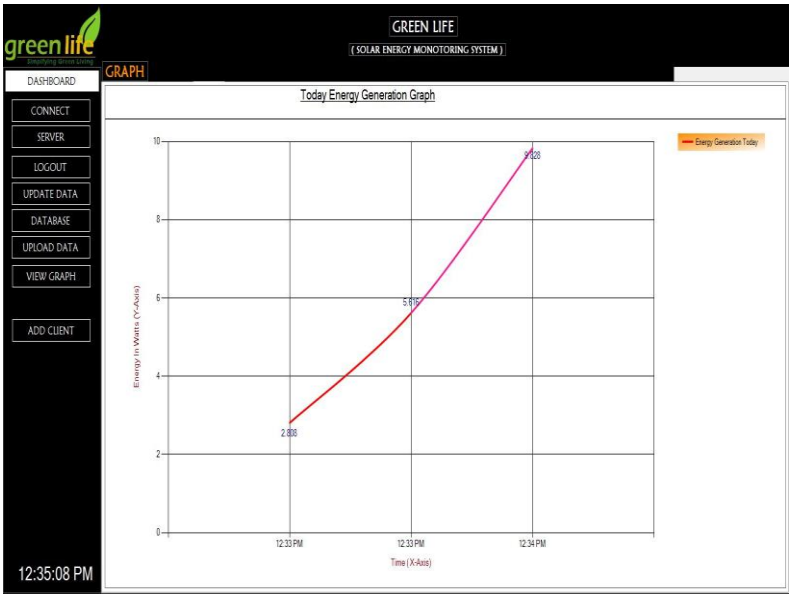

Figure 9: Graph

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